

## PUSH-PULL FOUR CHANNEL DRIVERS

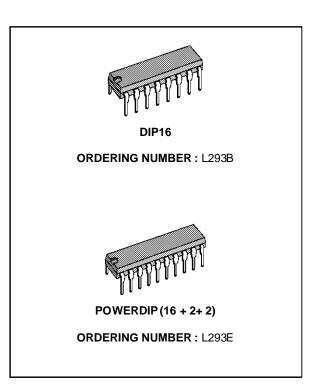
- OUTPUT CURRENT 1A PER CHANNEL
- PEAK OUTPUT CURRENT 2A PER CHANNEL (non repetitive)
- INHIBIT FACILITY
- HIGH NOISE IMMUNITY
- SEPARATE LOGIC SUPPLY
- OVERTEMPERATURE PROTECTION

#### **DESCRIPTION**

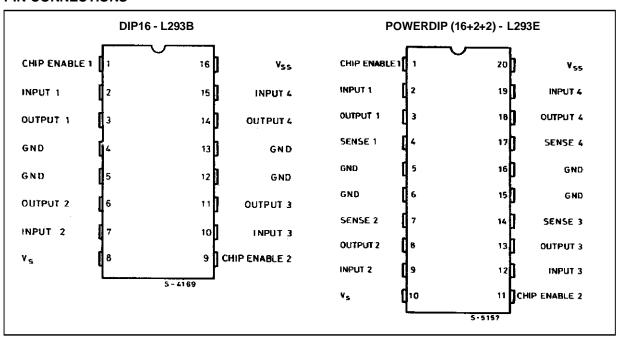
The L293B and L293E are quad push-pull drivers capable of delivering output currents to 1A per channel. Each channel is controlled by a TTL-compatible logic input and each pair of drivers (a full bridge) is equipped with an inhibit input which turns off all four transistors. A separate supply input is provided for the logic so that it may be run off a lower voltage to reduce dissipation.

Additionally, the L293E has external connection of sensing resistors, for switchmode control.

The L293B and L293E are package in 16 and 20-pin plastic DIPs respectively; both use the four center pins to conduct heat to the printed circuit board.

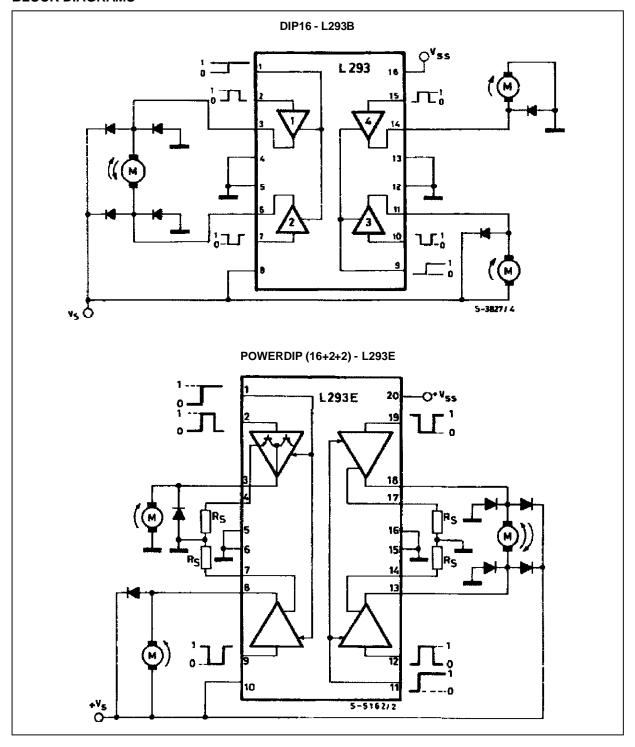


#### **PIN CONNECTIONS**

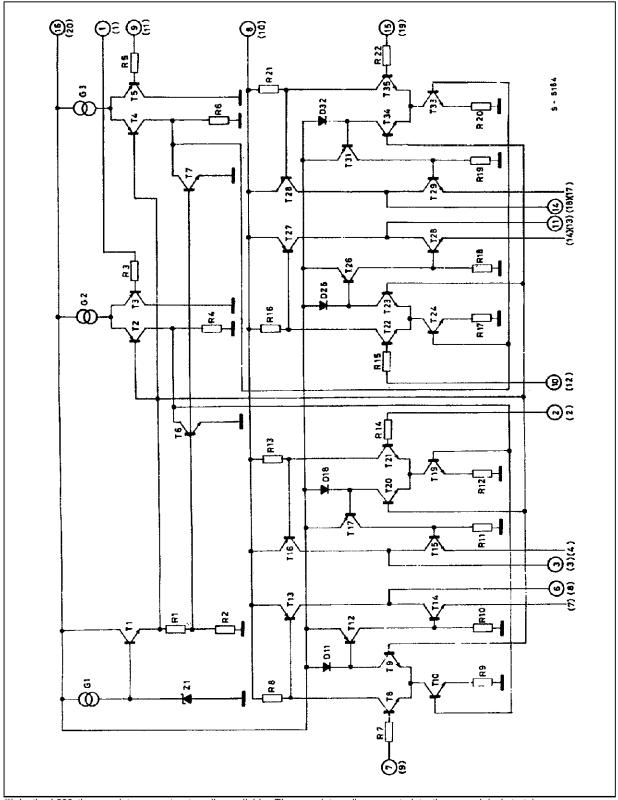


April 1993

## **BLOCK DIAGRAMS**



#### **SCHEMATIC DIAGRAM**



(\*) In the L293 these points are not externally available. They are internally connected to the ground (substrate). O Pins of L293 () Pins of L293E.

## **ABSOLUTE MAXIMUM RATINGS**

Symbol	Parameter	Value	Unit
Vs	Supply Voltage	36	V
V <sub>ss</sub>	Logic Supply Voltage	36	V
Vi	Input Voltage	7	V
$V_{inh}$	Inhibit Voltage	7	V
l <sub>out</sub>	Peak Output Current (non repetitive t = 5ms)	2	Α
P <sub>tot</sub>	Total Power Dissipation at T <sub>ground-pins</sub> = 80°C	5	W
T <sub>stg</sub> , T <sub>j</sub>	Storage and Junction Temperature	-40 to +150	°C

## THERMAL DATA

Symbol	Parameter	Value	Unit
R <sub>th j-case</sub>	Thermal Resistance Junction-case Max.	14	°C/W
R <sub>th j-amb</sub>	Thermal Resistance Junction-ambient Max.	80	°C/W

## **ELECTRICAL CHARACTERISTICS**

For each channel,  $V_S = 24V$ ,  $V_{SS} = 5V$ ,  $T_{amb} = 25^{\circ}C$ , unless otherwise specified

Symbol	Parameter	Test Conditions	Min.	TYp.	Max.	Unit
Vs	Supply Voltage		V <sub>ss</sub>		36	V
V <sub>ss</sub>	Logic Supply Voltage		4.5		36	V
Is	Total Quiescent Supply Current	$ \begin{array}{cccc} V_i = L & I_o = 0 & V_{inh} = H \\ V_i = H & I_o = 0 & V_{inh} = H \\ & V_{inh} = L \end{array} $		2 16	6 24 4	mA
I <sub>SS</sub>	Total Quiescent Logic Supply Current	$ \begin{array}{lll} V_i = L & I_o = 0 \\ V_i = H & I_o = 0 \end{array} & \begin{array}{lll} V_{inh} = H \\ V_{inh} = H \\ V_{inh} = L \end{array} $		44 16 16	60 22 24	mA
V <sub>iL</sub>	Input Low Voltage		-03.		1.5	V
V <sub>iH</sub>	Input High Voltage	$\begin{array}{l} V_{SS} \leq 7V \\ V_{ss} > 7V \end{array}$	2.3 2.3		V <sub>ss</sub> 7	>
l <sub>i</sub> ∟	Low Voltage Input Current	$V_{il} = 1.5V$			-10	μΑ
l <sub>iH</sub>	High Voltage Input Current	$2.3V \le V_{IH} \le V_{ss} - 0.6V$		30	100	μΑ
$V_{inhL}$	Inhibit Low Voltage		-0.3		1.5	V
$V_{inhH}$	Inhibit High Voltage	$V_{SS} \le 7V$ $V_{ss} > 7V$	2.3 2.3		V <sub>ss</sub> 7	>
linhL	Low Voltage Inhibit Current	$V_{inhL} = 1.5V$		-30	-100	μΑ
I <sub>inhH</sub>	High Voltage Inhibit Current	$2.3V \leq V_{inhH} \leq V_{ss} - 0.6V$			±10	μΑ
V <sub>CEsatH</sub>	Source Output Saturation Voltage	$I_0 = -1A$		1.4	1.8	<b>V</b>
V <sub>CEsatL</sub>	Sink Output Saturation Voltage	$I_0 = 1A$		1.2	1.8	V
V <sub>SENS</sub>	Sensing Voltage (pins 4, 7, 14, 17) (**)				2	>
t <sub>r</sub>	Rise Time	0.1 to 0.9 V <sub>o</sub> (*)		250		ns
t <sub>f</sub>	Fall Time	0.9 to 0.1 V <sub>o</sub> (*)		250		ns
t <sub>on</sub>	Turn-on Delay	0.5 V <sub>i</sub> to 0.5 V <sub>o</sub> (*)		750		ns
toff	Turn-off Delay	0.5 V <sub>i</sub> to 0.5 V <sub>o</sub> (*)		200		ns

See figure 1

## **TRUTH TABLE**

V <sub>i</sub> (each channel)	Vo	V <sub>inh</sub> <sup>(∞)</sup>
Н	Н	Н
L	L	Н
Н	X (°)	L
L	X (°)	L

<sup>\*\*</sup> Referred to L293E

<sup>(\*)</sup> High output impedance (\*\*) Relative to the considerate channel

Figure 1: Switching Timers

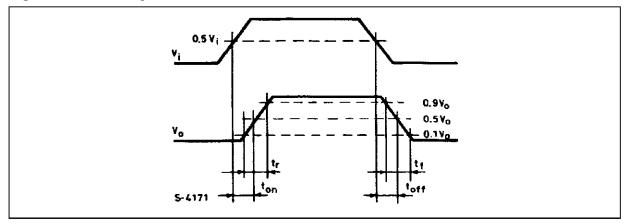


Figure 2: Saturation voltage versus Output Current

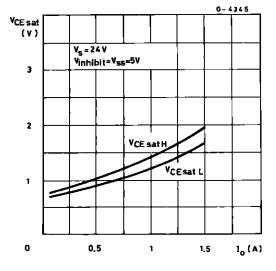


Figure 4: Sink Saturation Voltage versus Ambient Temperature

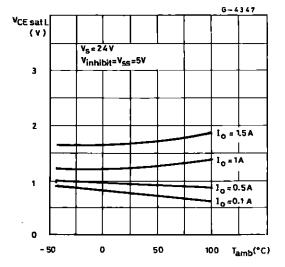


Figure 3: Source Saturation Voltage versus Ambient Temperature

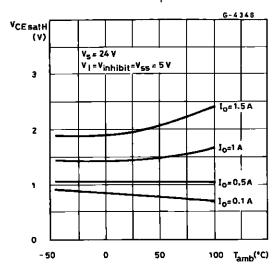


Figure 5: Quiescent Logic Supply Current versus Logic Supply Voltage

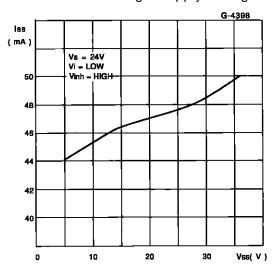


Figure 6: Output Voltage versus Input Voltage

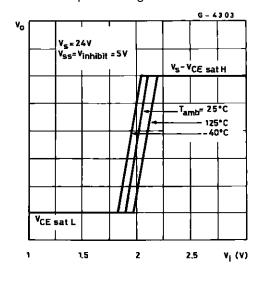
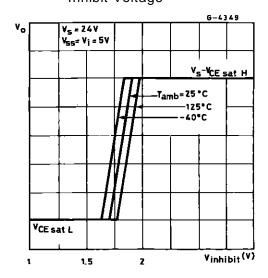
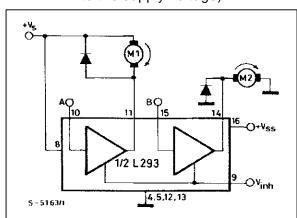


Figure 7: Output Voltage versus Inhibit Voltage



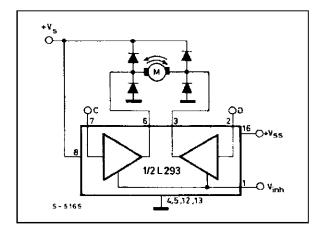
#### **APPLICATION INFORMATION**

Figure 8: DC Motor Controls (with connection to ground and to the supply voltage)



Vinh	Α	M1	B M2	
Н	Н	Fast Motor Stop	Н	Run
Н	L	Run L Fast Motor		Fast Motor Stop
L	Χ	Free Running Motor Stop	X Free Running Motor Stop	
L = Low		H = High	)	K = Don't Care

Figure 9: Bidirectional DC Motor Control



Inputs	Fund	ction
V <sub>inh</sub> = H	C = H; D = L	Turn Right
	C = L; D = H	Turn Left
	C = D	Fast Motor Stop
Vinh = L	C = X ; D = X	Free Running Motor Stop
L = Low	H = High	X = Don't Care

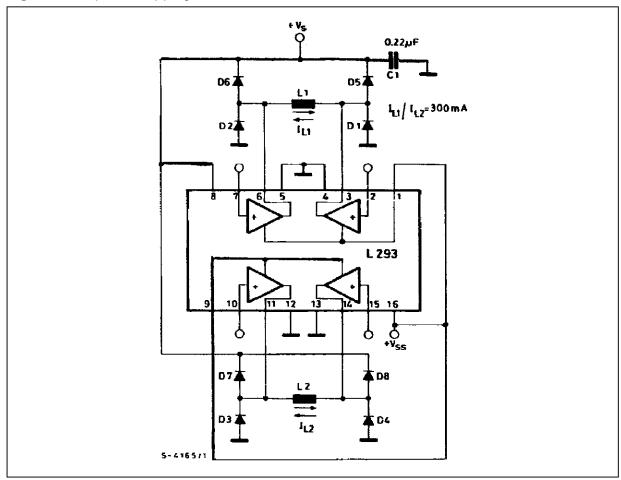


Figure 10 : Bipolar Stepping Motor Control

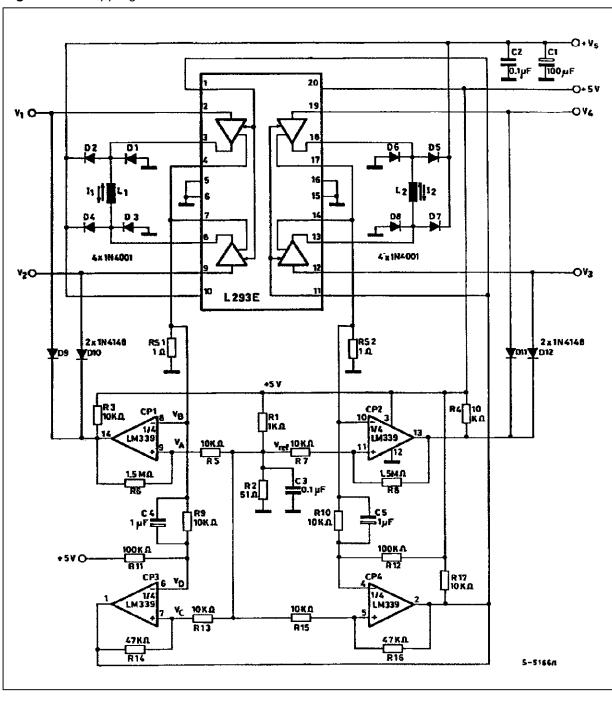
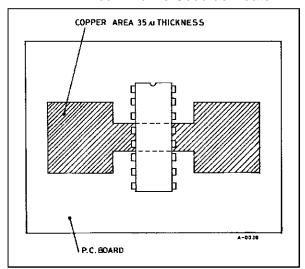


Figure 11 : Stepping Motor Driver with Phase Current Control and Short Circuit Protection

#### **MOUNTING INSTRUCTIONS**

The R<sub>th j-amb</sub> of the L293B and the L293E can be reduced by soldering the GND pins to a suitable copper area of the printed circuit board as shown in figure 12 or to an external heatsink (figure 13).

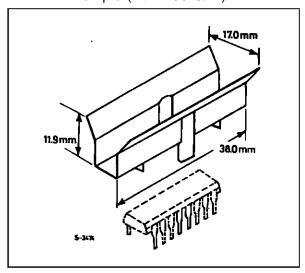
Figure 12 :Example of P.C. Board Copper Area which is Used as Heatsink



During soldering the pins temperature must not exceed 260°C and the soldering time must not be longer than 12 seconds.

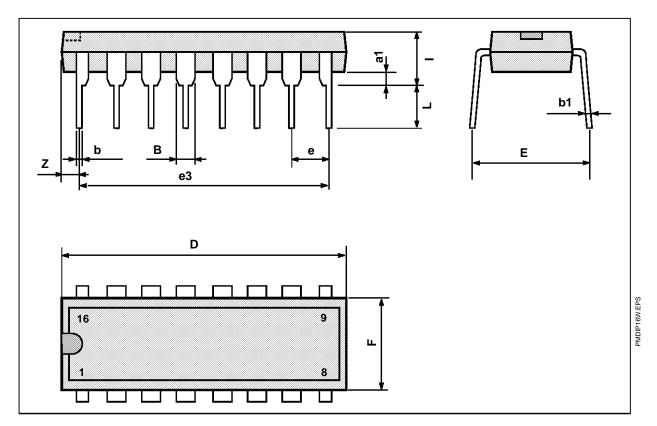
The external heatsink or printed circuit copper area must be connected to electrical ground.

Figure 13 :External Heatsink Mounting Example (Rth = 30°C/W)



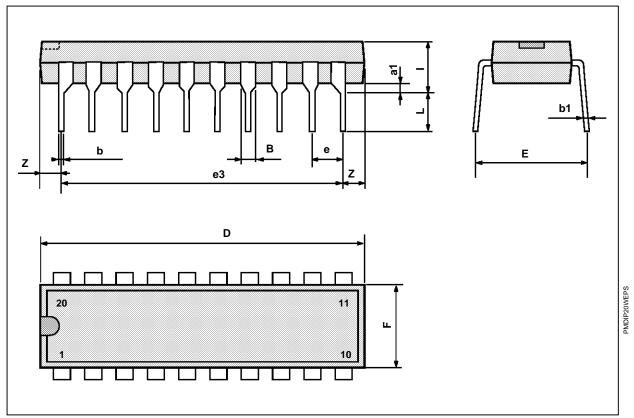
## **DIP16 PACKAGE MECHANICAL DATA**

Dimensions	Millimeters			Inches			
	Min.	Тур.	Max.	Min.	Тур.	Max.	
a1	0.51			0.020			
В	0.77		1.65	0.030		0.065	
b		0.5			0.020		
b1		0.25			0.010		
D			20			0.787	DIP16PW.TBL
Е		8.5			0.335		DIP16
е		2.54			0.100		
e3		17.78			0.700		
F			7.1			0.280	
i			5.1			0.201	
L		3.3			0.130		
Z			1.27			0.050	



# POWERDIP (16+2+2) PACKAGE MECHANICAL DATA

Dimensions		Millimeters			Inches		
	Min.	Тур.	Max.	Min.	Тур.	Max.	1
a1	0.51			0.020			
В	0.85		1.4	0.033		0.055	1
b		0.5			0.020		1
b1	0.38		0.5	0.015		0.020	
D			24.8			0.976	
Е		8.8			0.346		
е		2.54			0.100		
e3		22.86			0.900		
F			7.1			0.280	
i			5.1			0.201	
L		3.3			0.130		]
Z			1.27			0.050	



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